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ABSTRACT

This publication provides information on occupations in industrial metalworking in the Federal Republic of Germany. Section I contains the German vocational training regulations for these occupations, including an overview of training, examinations, reorganization of the industrial metalworking trades, and characteristic features of the new occupational structure. Section II provides descriptions and profiles of 17 new industrial metalworking occupations: industrial mechanic specializations: production mechanics, operation technique, engineering and systems engineering, and tool and fine tool engineering; tool mechanic specializations: punching and forming, moulding engineering, and instrument engineering; metal-cutting mechanic specializations: turning, automatic turning, cutting, and grinding; construction mechanic specializations: metal construction and shipbuilding, outfitting, and sheet metal construction; plant mechanic specializations: equipment engineering and supply engineering; and motor vehicle mechanic. Each occupation is described in terms of duration of vocational training and tasks. The occupation profile lists skills and knowledge with standard times in weeks from the general syllabus for each year of training. (YLB)

The new Industrial Metalworking Occupations

- Descriptions -

Federal Institute for Vocational Training
Der Generalsekretär

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I. The German Vocational Training Regulations in the Industrial Metal-working Occupations

Introduction

In early 1987, after about eight years of research, deliberation and negotiation, the Government of the Federal Republic of Germany signed into law an ordinance that fundamentally changed the way in which the German metal-working industry trains its apprentices[1]. It is important to note that the ordinance is a purely formal act of legislation: according to German law and standard procedure, the Federal Government enacts training regulations only after the two sides of industry, employers and labour - as represented by their sectoral and national employers associations and trade unions - have agreed on all the details[2].

Reaching this agreement had been far from easy in a period of growing economic difficulties and an increasingly strained industrial relations climate. In their negotiations the union and the employers association of the metal-working sector were assisted by a Federal agency, the Federal Institute for Vocational Training (BIBB), which did most of the research for the project and steered it through the complex procedure of consultation and coordination with, among others, the Ministries of Education of the eleven Federal Länder. Since these provide essential supplementary instruction, a change in national training regulations also requires their agreement.

From their formal enactment, the new training regulations were hailed as an historic event, by employers as well as by the union. In response to the micro-electronics revolution of the 1970s and 1980s, the 37 trainee occupations that had previously existed in German metal-working - and that had for a long time formed a central element of the industry's culture - were streamlined into no more than six, five of which were subdivided into altogether just sixteen specialization. In addition, the duration of the standard apprenticeship was extended from three to three-and-a-half years.

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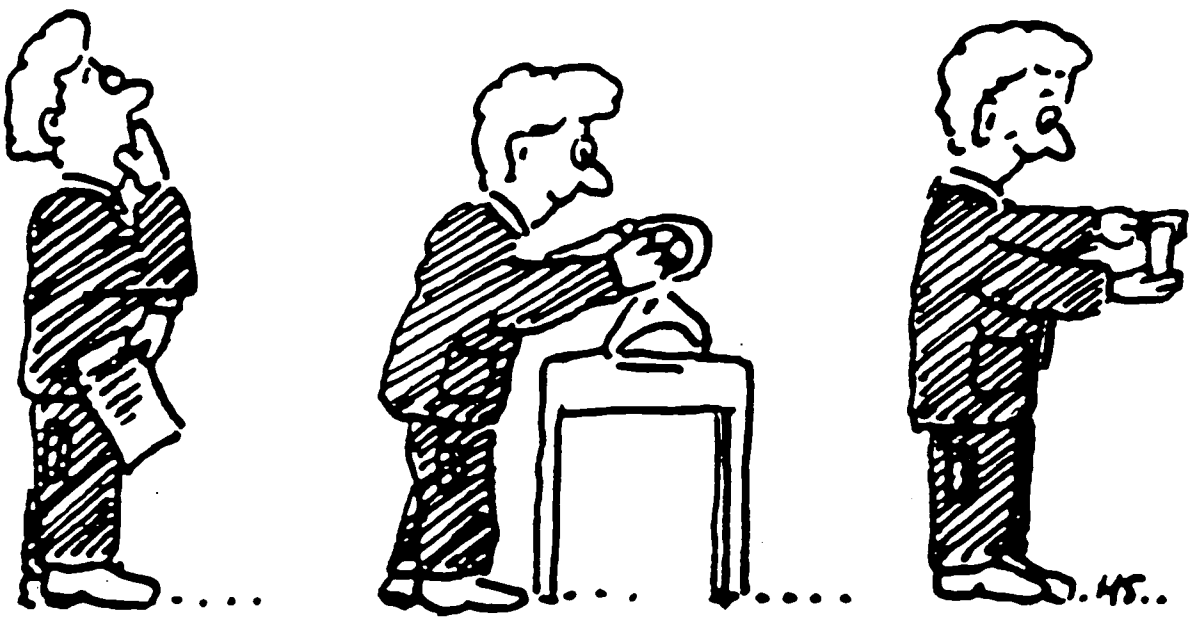
1) The metal-working industry includes the entire metal engineering sector, from the manufacturing of musical instruments to motor vehicles and aircraft. With some four million employees in a national workforce of about 22 million, this is the largest sector of the West German economy. All figures refer to former West Germany, excluding the former German Democratic Republic. Metal manufacturing, together with chemicals, accounts for the largest part of West Germany's export surplus.

2) This is called the 'consensus principle'. In fact, the responsible ministry, the Federal Ministry of Economics, does not have the resources to take an initiative in this area. All it does is ascertain whether there is a 'consensus' among all parties concerned at sectoral and national level and sign into law whatever the two sides of industry (i.e. employers and labour) present to it.

Self-reliant

Planning ... - Carrying out ... - Checking

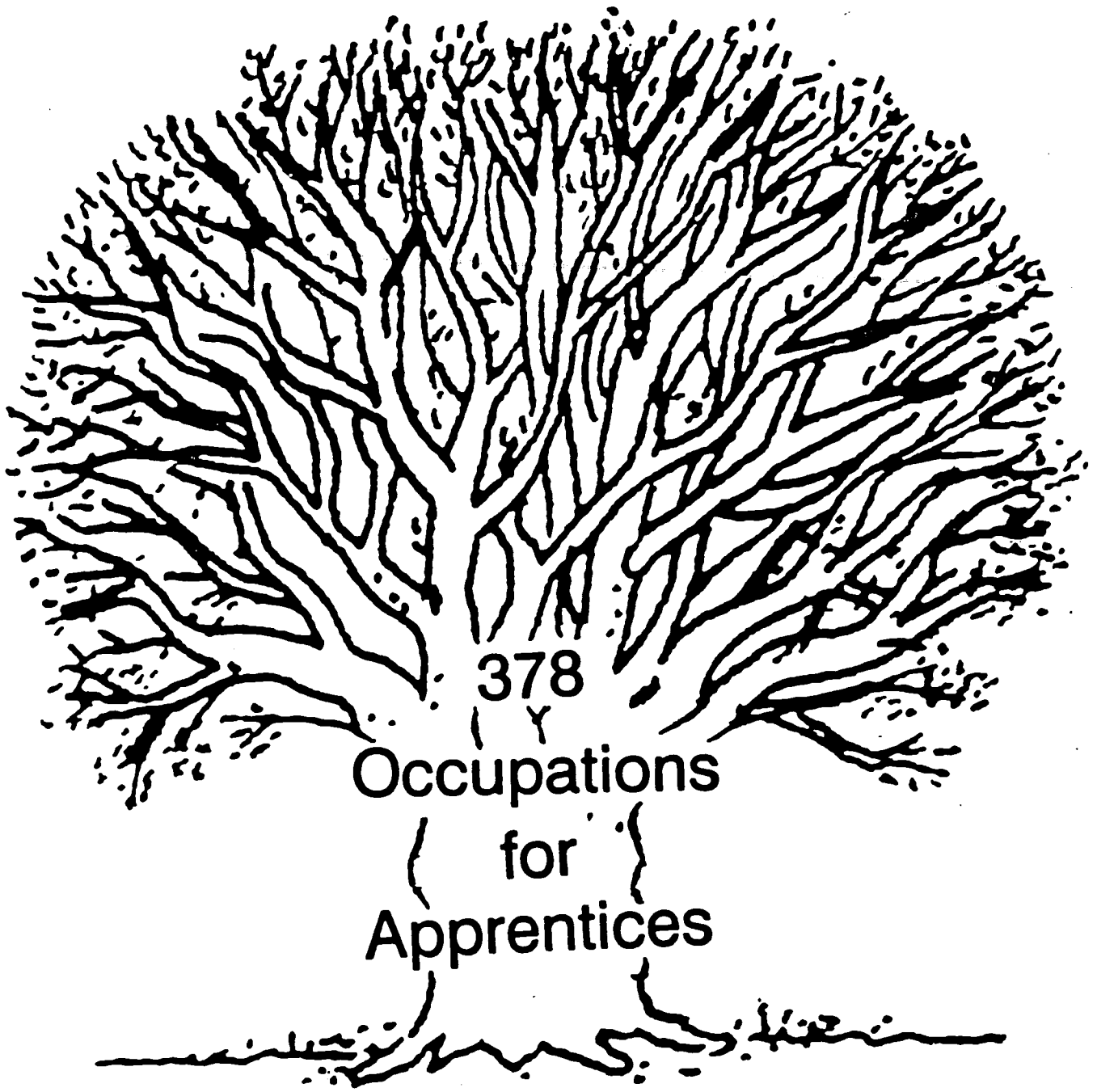


Apprentices in all the six new occupations receive identical training in the first year. In the first half of the second year, the occupations of industrial mechanic and tool mechanic as well as those of construction mechanic and plant mechanic continue to be taught under identical syllabi. It is only from the third year on that training is separate for the sixteen specialization and the one occupation - motor vehicle mechanic - which is not subdivided.

The comprehensive streamlining of training syllabi and occupation profiles, the main achievement of the new training regulations, was to enhance worker flexibility and the ability of the workforce to assimilate technological developments. By extending the range of skills in the individual occupations, the new training scheme makes for broader and more flexible job definitions. Moreover, by creating a broad common skill base, it makes it easier for manpower to move from one occupation to another, and to be retrained generally or receive further training. It also enables them to understand better what other workers are doing and thus function more effectively in a self-regulating, horizontally cooperative, decentralized work organization (Fig.1). In radically overhauling the skills and knowledge of the various occupations, the new regulations also eliminated outdated segments of the syllabus and generally shifted the emphasis towards the application of information technologies, especially the writing and editing of programmes, the reading and preparation of blueprints and statistical sheets and the development of mathematical skills in general.

About two-thirds of each age group in Germany undergo an apprenticeship. There are about 378 trainee occupations, many of them in the service sector (Fig.2). Not all syllabi are equally demanding; especially since the reform, the metal-working occupations rank among the more difficult ones. At the present time an estimated 150,000 young people, including an increasing number of women, are apprentices in a metal-working occupation; together they account for about five per cent of the industry's workforce. More than two-thirds of that workforce are today classified as 'skilled' at or above apprenticeship level. Among younger workers this percentage is much higher. Indeed it has become increasingly difficult to find a job in the German metal-working industry without being a skilled metal worker. In future, thanks largely to the 1987 reform, the aggregate skill level of the workforce in the German metal industry will continue to rise. This will provide the industry with an outstanding capacity to innovate and produce at quality standards that will, even more than in the past, enable its firms and workers to withstand international price competition.

25.000 Types of Jobs



Previous Attempts at Reorganization

Many of the regulations governing the industrial metal-working trades (occupation profiles, training syllabi, examination requirements) dated from the 1930s.

There have been many changes in the metal sector over almost half a century of technical development and progressive rationalization. For example, new methods and technologies have been developed and introduced. These developments have also been reflected in job specifications and have led to the inclusion of new subjects in vocational training courses.

The scope and scale of the changes which have taken place - including many in society at large - prompted a number of attempts to update and reorganize trainee occupations in the metal-working industry. One product of these efforts was the drawing up in the early 1970s of a phased training programme for the precision metalworking and machine tool trades. Although draft training regulations were approved by the sectoral committees of the Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung) and were submitted to the proper authority, no new training directives were in fact issued, partly because the employers and unions differed on the question of progression to the second phase of the training programme and it was feared that problems would arise in connection with the introduction of the basic vocational training year in schools.

Background

The reorganization of the industrial metal-working trades is especially important because this is the first time that a very large number of trades in one sector of the economy have been reorganized in the entire occupational field. The structure of these 37 different trainee occupations had grown up over many years and encompassed an extremely wide range of skills. The number of trainees in the various trades also varied widely. Certain trades, such as machine fitter with 48,000 and toolmaker with 22,000 were heavily subscribed, while others, the so-called 'splinter trades' such as diamond drawing die maker with 19 and hollow ware coppersmith with only 1, were very small indeed. The reorganization of the industrial metal-working occupations affects the training of a total of around 150,000 people, almost half of all the trainees in manufacturing occupations in the whole of industry.

The jobs performed by many of these skilled craftsmen are often as little known as the names of their trades. Who knows, for instance, that a surgical instrument maker makes instruments and tools

ranging from surgeon's forceps to reflex-testing hammers or that a utility pipe layer lays and maintains municipal water and gas supply pipes.

On the basis of the 'Reference Data for the Reorganization of the Industrial Metal-working Trades' agreed between Gesamtmetall (employers organization) and IG Metall (trade union), preparatory work began under the chairmanship of the Federal Institute for Vocational Training.

The way this was done is interesting in itself. In 1982, the Federal Institute for Vocational Training asked 180 experts to evaluate altogether 358 elements of the syllabi for the then 37 trainee occupations. The elements were classified in six sectors: manufacturing, assembly, testing, drawing, materials, other. Each element was evaluated according to 14 criteria - for example, its relative importance for the performance of the respective occupation. The information gleaned, consisting of more than 200,000 data units, was analyzed using advanced statistical methods (e.g. discriminant and cluster analysis) to establish similarities, identify overlapping between individual occupations and to develop future training courses, including the definition of subjects.

This achievement, like all advances, was due to the cooperation and commitment of the experts involved. In mid-1984, with this preparatory work providing a solid foundation, the two sides of industry were able to take a broadly accepted and definitive decision on the number and structure of the new trades.

Characteristic Features of the New Occupational Structure

The new occupational structure defines six industrial metal-working occupations (cf. Section I and Fig. 1). Their main characteristics are as follows:

- Instead of the previous 37 occupations in industrial metal-working, there are now six new occupations. Five of these occupations include areas of specialization; one occupation (motor vehicle mechanic) is not specialized.

- The duration of training for all the new occupations is a uniform 3½ years.
  (The duration of training for the previous metal-working occupations was either 3 or 3½ years).

- All occupation designations end with the word 'mechanic' (m/f).

(The uniform duration of training and the same ending to the designation emphasize the equality of the new metal-working occupations.)

- All the new metal-working occupations share a common basic vocational training in the first year.
- Separate specialized training for each occupation begins with the second year. This specialized training is always the same in the first semester of the second year of training for industrial mechanics and metal cutting mechanics and for construction mechanics and plant mechanics respectively (Subsection (2) Section 3). These common features in the individual occupations are depicted in Fig. I by the continuous boxes.
- The 1½-year advanced training in subject areas commences in the third year of training.
- The subject matter is based on the level of the final class at a secondary school (Hauptschule).
- Training in the new metal-working occupations is open to young men and women alike.

With the present occupational structure, the profile for a trainee occupation consists of the common training for all areas of specialization and the separate parts depending on the specific area of specialization (cf. Sections 4-8). The duration of training for the common part is two years and 1½ years for the specialized section. The substance of the training is also formulated in the same way for the common training part but it is different in the parts divided into different areas of specialization. Nonetheless, the areas of specialization of an occupation also share common subject matter on occasion.

The subject matter for the various cutting technologies using machine tools thus have a common broad basis, for example. Consequently, it was possible to combine the specific features in the cutting trade into one trainee occupation entitled cutting mechanic. All cutting mechanics receive identical training for the first two years. In the following 1½ years, they are then given specialized training in one of the four areas of specialization.

The occupation profiles were pared down within the framework of an overall concept.

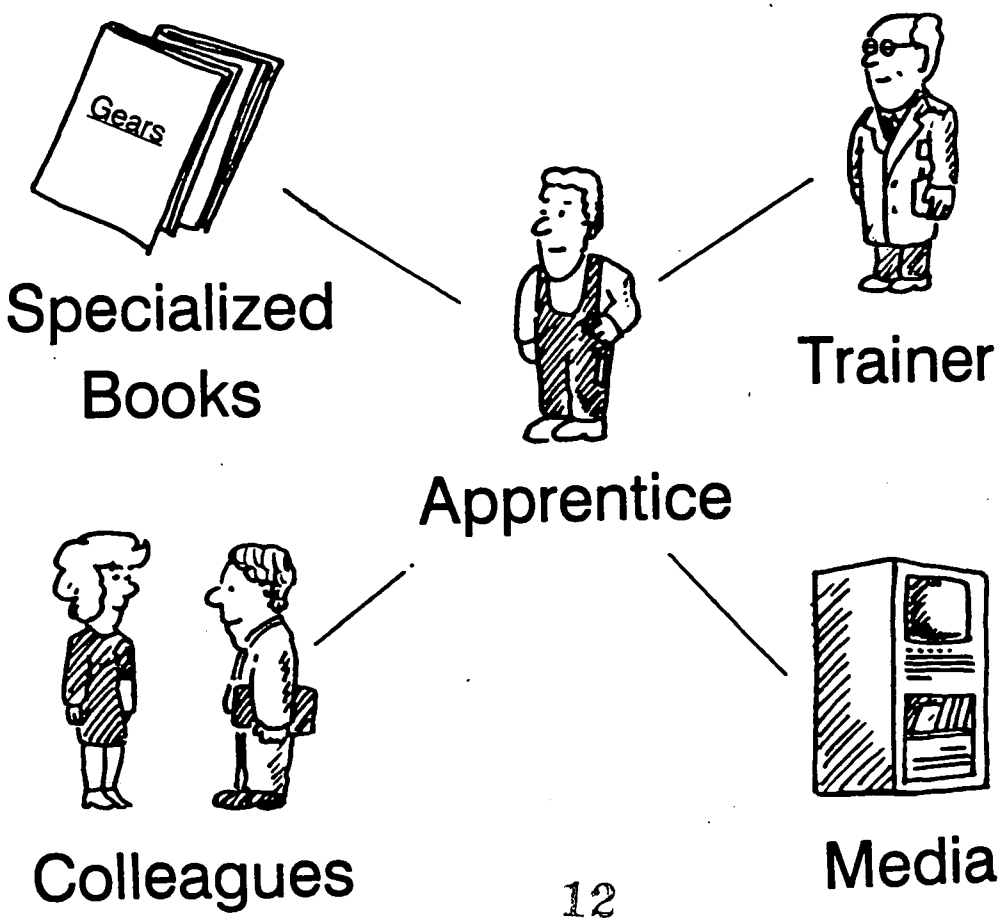
The individual areas of specialization are clearly defined and can be allocated to the various occupational fields in the metal-working industry.

The labour market is far clearer and more transparent as a result.

Training enterprises that have imparted training in a number of different, but functionally related, trades in the past can restrict themselves to a small number of occupation profiles in the future. Training can be structured more rationally and efficiently as a result. School-leavers and vocational counselling will also benefit from the improved clarity and transparency. Making a decision on the basis of the reduced number of occupation profiles is certainly easier than it was with the previous metal-working occupations.

Role of the Trainer

Who is in the Focus?



II

Descriptions and Profiles

of the new Industrial Metalworking Occupations

in the Federal Republic of Germany

INDUSTRIAL MECHANIC

Specialization: **Production Mechanics**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the industrial mechanic in the specialized subject area of production mechanics is qualified to perform work assignments in the area of industrial continuous series production.

Their tasks involve installation, start up, controlling, monitoring and maintenance of automated production equipment and manufacturing systems in plants with machine cutting production or assembly lines. They identify malfunctions and faults, remove their causes or instigate their removal by intervention in the production cycle and replace parts of the production system. Industrial mechanics in the specialized subject area of production mechanics supervise product quality control by checking at regular intervals. They use single gauges, test stations and check visually, coordinate activities with production planning and scheduling, supply the production line with stock and operating materials, execute the respective disposal of materials and record production data in appropriate documents.

In series production these tasks are executed independently while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	4
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	1	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	5	
Machine cutting	4	6	
Separating, shaping	4	2	
Joining	8	2	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits		3	
Assembling components and assemblies		18	
Testing and adjusting single functions at assemblies by gauging and recording data for work strokes and operating data		3	
Maintaining machinery and equipment or systems,			6
Thermal separation			1
Installing and testing hydraulic circuits of control systems, testing function of digitally controlled components, machines or systems as well as electrical components			8
Checking and adjusting functions on assemblies machines, systems and production lines			8
Preventative maintenance, identifying, localizing and correcting faults and failures			12
Starting up machinery and production equipment			2
Equipping and adjusting machinery, systems and production equipment, ensuring and monitoring input and disposal of operating materials			12
Operating and programming machinery and production lines, monitoring production sequence and ensuring product quality control			25
	52	52	78

* To be imparted during the entire training period

INDUSTRIAL MECHANIC

Specialization: **Operation Technique**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the industrial mechanic in the specialized subject area of operation technique is qualified to perform work assignments in the area of operating and recommissioning machinery and equipment.

Their tasks involve inspecting, maintaining and repairing machinery and equipment as well as adjusting operating equipment to changing conditions. They dismantle and assemble components and assemblies in order to maintain operations, localize faults, remedy malfunctions and recommission machinery or equipment after checking their proper functioning.

These work procedures require a high degree of alertness and the ability to identify wear (on the machinery) and carry out or instigate appropriate repair work taking into account technical and economic considerations. Special perceptiveness and communicative skills are required for safety precautions at the place of repair and the transport of the spare and dismantled parts as well as in cooperation with other departments. When emplacing support beams or scaffolding attention needs to be paid to the remainder of the plant which is in full operation.

These tasks are mainly performed outside of production sites and repair shops at changing locations.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	4
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	1	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	5	
Machine cutting	4	6	
Separating, shaping	4	2	
Joining	8	2	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits,		3	
Assembling components and assemblies		18	
Testing and adjusting single functions at assemblies by gauging and recording data for work strokes and operating data		3	
Thermal cutting off, hot forming Fusion welding			5
Installing and testing hydraulic circuits as well as electrical components of control engineering systems			15
Dismantling and assembling equipment and assemblies			8
Installing. mounting and connecting machinery, equipment and assemblies			8
Transport and securing			3
Checking and adjusting functions on assemblies, machinery or systems			5
Identifying, localizing and correcting faults and failures			16
Starting up machinery or systems and maintaining operating functions			14
	52	52	78

* To be imparted during the entire training period

INDUSTRIAL MECHANIC

Specialization: **Engineering and Systems Engineering**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the industrial mechanic in the specialized subject area of engineering and systems engineering is qualified to perform work assignments in the area of manufacturing and maintenance of machinery and production systems.

Their tasks involve manufacturing, testing, starting up, maintaining, inspecting and repairing engines, machinery, machine tools and specialized machinery and ancillary equipment as well assembling these into systems. For their work assignments they mainly use semi-finished products, finished parts and standard parts and they also fabricate their own assembly parts. Industrial mechanics in the specialized subject area of engineering and systems engineering work independently or in teams on the assembly of single machines or small batch assembly or in maintenance. Work tasks require exact knowledge of geometrical and position tolerances and their conversion during assembly. During assembly the basic principles of the interrelations of machine parts and their transmission of power and movement need to be taken into account.

These tasks are performed independently at changing and at permanent assembly locations, indoors as well as at construction sites while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	4
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	1	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	5	
Machine cutting	4	6	
Separating, shaping	4	2	
Joining	8	2	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits		3	
Assembling components and assemblies		18	
Testing and adjusting single functions at assemblies by gauging and recording data for work strokes and operating data		3	
Installing work places			3
Maintaining machinery and systems			4
Thermal separation, hot-forming			2
Fusion welding			3
Installing and testing hydraulic circuits of control systems, testing function of digitally controlled components, machines or systems, as well as electrical components			5
Assembling and dismantling machinery or systems			25
Assembling and dismantling supply systems			5
Intermediate testing of assemblies and subsystems			5
Checking and adjusting functions; starting up machines or systems			12
Identifying, localizing and correcting faults and failures			10
	52	52	78

* To be imparted during the entire training period

INDUSTRIAL MECHANIC

Specialization: **Tool and Fine Tool Engineering**

Duration of Vocational Training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training the industrial mechanic in the specialized subject area of tool and fine tool engineering is qualified to perform work assignments in the area of manufacturing and maintaining assemblies groups and systems.

Their tasks involve manufacturing, assembling, testing, starting up, maintaining, inspecting and repairing adjustment equipment, gauges, scales and meters, devices, ancillary equipment for manufacturing and assembly, office equipment, photo, film and video equipment, medical and optical equipment.

For their work assignments they mostly use semi-finished products and standard metal and plastic parts. A high degree of precision work is required due to the comparatively small mechanical, pneumatic and electronic components and drives and their correlations.

These tasks are mainly performed independently in model construction, in single-product or small batch production, assembly, quality control and servicing while observing the pertinent laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	4
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	1	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	5	
Machine cutting	4	6	
Separating, shaping	4	2	
Joining	8	2	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits,		3	
Assembling components and assemblies		18	
Testing and adjusting single functions at assemblies by gauging and recording data for work strokes and operating data		3	
Measuring with electrical equipment			6
Manufacturing work pieces by machine cutting			14
Soldering, fusion welding, bonding			
Installing and testing circuits of control systems with electro-mechanical and electro-pneumatic components, writing programmes for digitally controlled machine tools			4 5
Assembling and dismantling equipment and systems			14
Manufacturing components and assemblies while taking into consideration the combination of various production methods			16
Checking and adjusting functions, starting up equipment and systems			7
Identifying, localizing and correcting faults and failures			8
	52	52	78

* To be imparted during the entire training period

TOOL MECHANIC

Specialization: Punching and Forming

Duration of Vocational Training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training the tool mechanic in the specialized subject area of punching and forming is qualified to perform work assignments in the area of manufacturing and repair of products in punching and forming.

Their tasks involve manufacturing, maintaining and inspecting cutting tools, reshaping and machining tools, devices, gauges and templates as well as measuring and testing devices.

The products are manufactured and repaired manually and by machine according to technical drawings with a high degree of dimensional accuracy and surface finish.

These tasks are performed independently in single-part production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading. applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	3	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	4	
Machine cutting	4	14	
Separating, shaping	4	2	
Joining	8	4	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits,		3	
Assembling components and assemblies		7	
Writing programmes for digitally controlled machine tools		2	
Heat treatment for tool parts		1	
Manual cutting of work pieces			14
Manufacturing of work pieces while taking into consideration the combination of various machine production procedures			26
Installing and testing circuits of control systems with electro-technical components, optimizing and testing programmes for digitally controlled machine tools			5
Assembly and dismantling of tools, devices and gauges			17
Hardness testing			1
Checking of functions and start up of tools			3
Repair of tools, devices and gauges			12
	52	52	78

* To be imparted during the entire training period

TOOL MECHANIC

Specialization: MOULDING ENGINEERING

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the tool mechanic in the specialized subject area of moulding engineering is qualified to perform work assignments in the area of manufacturing and maintaining moulds and die blocks.

Their tasks involve manufacturing, assembling, maintaining, inspecting and repairing of die casting moulds, blow casting moulds, brush casting moulds, pressure die casting moulds and injection moulds, of ingot moulds and die blocks as well as engraving and the appropriate work tools for this procedure. The products are manufactured manually and by machine with a high degree of geometrical and dimensional accuracy according to a sample and technical drawings.

These tasks are performed independently in single-part production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	3	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	4	
Machine cutting	4	14	
Separating, shaping	4	2	
Joining	8	4	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits		3	
Assembling components and assemblies		7	
Writing programmes for digitally controlled machine tools		2	
Heat treatment for tool parts		1	
Treating of flat surfaces, manufacturing of contours and engravings by manual cutting			12
Manufacturing of work pieces while taking into consideration the combination of various machine production procedures			17
Installing and testing circuits of control systems with electrotechnical components, optimizing and testing of programmes for digitally controlled machine tools			5
Assembly and dismantling of moulds			6
Hardness testing			1
Checking of functions and commissioning of moulds			2
Repair of moulds			9
Manufacturing of moulds, models and hand tools using various production procedures			26
	52	52	78

* To be imparted during the entire training period

TOOL MECHANIC

Specialization: Instrument Engineering

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the tool mechanic in the specialized subject area of instrument engineering is qualified to perform work assignments in the area of manufacturing and maintaining products in instrument engineering.

Their tasks involve manufacturing, assembling, maintaining, inspecting and repairing surgical, cosmetic and general instruments, of implants and medical equipment. The products are manufactured manually and by machine with a high degree of geometrical accuracy and surface finish according to technical drawings and samples.

These tasks are performed independently in serial production and single-part production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	3	
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	4	
Machine cutting	4	14	
Separating, shaping	4	2	
Joining	8	4	
In-depth treatment of basic vocational training	12		
Installing and testing pneumatic circuits		3	
Assembling components and assemblies		7	
Writing programmes for digitally controlled machine tools		2	
Heat treatment for tool parts		1	
Treating of flat surfaces and shapes on instruments, implants or devices by manual cutting			20
Manufacturing work pieces while taking into consideration the combination of various machine production procedures			10
Installing and testing circuits of control systems with electro-technical components			2
Assembling and dismantling instruments implants or devices			19
Hardness testing			1
Fabricating and checking functions of instruments, implants or devices			22
Repairing instruments or devices			4
	52	52	78

* To be imparted during the entire training period

METAL-CUTTING MECHANIC

Specialization: TURNING

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the metal cutting mechanic in the specialized subject area of turning is qualified to perform work assignments in the area of cutting with machine tools in turning.

Their tasks involve manufacturing workpieces by turning and drilling with conventional or digitally controlled machine tools. The workpieces need to be geometrically and dimensionally accurate and are made for machines, devices and equipment. With single-point cutting tools, the metal cutting mechanic in turning works on metallic and non-metallic castings and semi-finished products as well as workpieces with mainly cylindrical shapes that have undergone preliminary machining as well as non-chip producing processes.

Metal cutting mechanics in the specialized subject area of turning work according to technical documents, plan the production process and write programmes for stored-programme machinery. They install lathes including the tools and fixtures. They supervise the production process, check the quality of the workpieces, evaluate the work results and instigate procedures for quality control.

These tasks are performed independently in single-part production and serial production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge	Standard Times in weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	5 4	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	6
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	4	
Adjusting and clamping tools and workpieces	2	5	
Manual cutting	8	5	
Machine cutting	4	26	
Separating, shaping	4		
Joining	8		
In-depth treatment of basic vocational training	12		
Installing lathes, tools and fixtures			9
Adjusting and clamping tools, workpieces and fixtures on lathes			9
Operating and supervising lathes			18
Writing programmes and optimizing programmes for digitally controlled machine tools as well as manufacturing workpieces on these machine tools			8
Machining workpieces on lathes or digitally controlled machine tools			18
Testing workpieces and ensuring quality control			4
Testing, sharpening of turning and drilling tools			3
Maintaining lathes			3
	52	52	78

* To be imparted during the entire training period

METAL-CUTTING MECHANIC

Specialization: **Automatic Turning**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the metal cutting mechanic in the specialized subject area of automatic turning is qualified to perform work assignments in the area of metal cutting serial production on automatic lathes.

Their tasks involve manufacturing complex turned parts with conventional or digitally controlled automatic lathes. The parts need to be geometrically and dimensionally accurate and are manufactured for all areas of industry. With single-point cutting tools and numerous special tools, metal cutting mechanics in automatic turning work on metallic and non-metallic contoured bars as well as castings, forgings and semi-finished sinter products.

Metal cutting mechanics in the specialized subject area of automatic turning work according to technical documents, plan the production process and write programmes for stored-programme machinery They install the tool systems, the workpiece clamping systems and the operating sequence programme of the machine according to an installation plan. During production they supervise product quality by checking at regular intervals and by documenting the test results. They supply the production machines with workpieces and ancillary material and effect their respective removal. They identify malfunctions and quality defects, trace their cause and eliminate the faults.

These tasks are performed independently in single-part and serial production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	5 4	3
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	6
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	4	
Adjusting and clamping tools and workpieces	2	5	
Manual cutting	8		
Machine cutting	4	26	
Separating, shaping	4		
Joining	8		
In-depth treatment of basic vocational training	12		
Installation of automatic Lathes, tools and additional apparatus			25
Adjusting and clamping tools and workpieces on automatic lathes			6
Operating and supervising automatic lathes			8
Writing programmes and optimizing of programs for digitally controlled machine tools as well as manufacturing work pieces on these machine tools			8
Machining of workpieces on automatic lathes or digitally controlled machine tools			8
Testing of workpieces and ensuring quality control			6
Grinding and testing turning and drilling tools			6
Maintenance of automatic lathes			2
	52	52	78

* To be imparted during the entire training period

METAL-CUTTING MECHANIC

Specialization: **Cutting**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the metal cutting mechanic in the specialized subject area of cutting is qualified to perform work assignments in the area of machining on milling machines as well as boring mills and horizontal drilling, boring and milling machines.

Their tasks involve manufacturing workpieces by milling and drilling/boring with conventional or digitally controlled machine tools. The workpieces need to be geometrically and dimensionally accurate and are made for machines, fixtures and equipment. With predominantly multi-edge cutting tools metal cutting mechanics in cutting work on metallic and non-metallic castings, forgings, welding constructions and pre-treated, semi-finished products and workpieces.

Metal cutting mechanics in the specialized subject area of cutting work according to technical documents, plan the production process and write programmes for stored-programme controlled machinery. They install milling machines or boring mills and horizontal drilling, boring and milling machines including the tools and fixtures. They supervise the production process, check the quality of the workpieces, evaluate the work results and instigate procedures for quality control.

These tasks are performed independently in single part-production and serial production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF
with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	5 4	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	6
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	4	
Adjusting and clamping tools and workpieces	2	5	
Manual cutting	8		
Machine cutting	4	26	
Separating, shaping	4		
Joining	8		
In-depth treatment of basic vocational training	12		
Installing milling machines or boring mills and horizontal drilling, boring and milling machines, tools and fixtures			9
Adjusting and clamping tools, workpieces and fixtures on milling machines or boring mills, horizontal drilling, boring and milling machines			11
Operating and supervising lathes			17
Writing programmes, programming and optimizing programmes for digitally controlled machine tools as well as manufacturing workpieces on these machine tools			8
Machining workpieces on milling machines, boring mills, horizontal drilling, boring and milling machines or digitally controlled machine tools			16
Testing workpieces and ensuring quality control			5
Sharpening drilling and turning tools and testing milling, drilling and turning tools			3
Maintaining milling machines or boring mills, horizontal drilling, boring and milling machines			3
	52	52	78

* To be imparted during the entire training period

METAL-CUTTING MECHANIC

Specialization: **Grinding**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the metal cutting mechanic in the specialized subject area of grinding is qualified to perform work assignments in the area of machining on grinding machines.

Their tasks involve manufacturing workpieces as well as sharpening metal cutting tools by grinding procedures with conventional or digitally controlled machine tools. The workpieces need to be geometrically and dimensionally accurate and are manufactured for production tools, machines, fixtures and equipment. With cutting tools of undetermined cutting geometry, metal cutting mechanics in grinding work on ferrous and non-ferrous metal, sintered hard carbide as well as heat-treated steels. The highest possible degree of dimensional, geometrical and positional accuracy and surface finish must be achieved.

Metal cutting mechanics in the specialized subject area of grinding work according to technical documents, plan the production process and write programmes for stored-programme machinery. They install grinding machines including the tools and fixtures. They supervise the production process, check the quality of the workpieces, evaluate the work results and instigate procedures for quality control.

These tasks are performed independently in single-part and serial production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	5 4	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	6	6
Maintaining working equipment and production plant	2	2	
Quality control, marking out and marking	3	4	
Adjusting and clamping tools and workpieces	2	5	
Manual cutting	8		
Machine cutting	4	26	
Separating, shaping	4		
Joining	8		
In-depth treatment of basic vocational training	12		
Installing grinding machines, tools, devices			9
Adjusting and clamping tools, workpieces and fixtures on grinding machines			9
Operating and supervising grinding machines			18
Writing programmes, programming and optimizing programmes for digitally controlled machine tools and manufacturing workpieces on these tools			8
Testing workpieces and ensuring quality control			4
Testing and dressing grinding tools			2
Maintaining grinding machines			3
	52	52	78

* To be imparted during the entire training period

CONSTRUCTION MECHANIC

Specialization: **Metal Construction and Shipbuilding**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the construction mechanic in the specialized subject area of metal construction and shipbuilding is qualified to perform work assignments in the area of manufacturing and repair of large-scale components and constructions made of steel and non-ferrous metals.

Their tasks involve manufacturing, assembling, reconstructing and repairing steel skeleton structures, expanded steel structures and panelling of metal constructions. They manufacture and assemble ships or offshore-systems and other floating devices, bridges, steel lines, conveyance machinery, vehicle frames, structures to be mounted on vehicles or constructions for hydraulic steel engineering.

These tasks are performed in teams with the aid of transport and lifting equipment mostly in independent single-part production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	8	
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	5	2
Maintaining working equipment and production plant	2		
Quality control, marking out and marking	3		
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	2	3
Machine cutting	4	5	2
Separating, shaping	4	14	
Joining	8	8	
In-depth treatment of basic vocational training	12		
Assembling components into assemblies		10	
Reading, applying and drafting technical documents			16
Separating, shaping			7
Joining, especially by shielded arc welding, bolts and screws			6
Drawing and marking components and assemblies			5
Checking components and assemblies for construction			4
Assembling and dismantling components, assemblies and large-scale metal constructions			26
Erecting scaffolding and other ancillary structures			4
Fastening, securing and transporting			3
	52	52	78

* To be imparted during the entire training period

CONSTRUCTION MECHANIC

Specialization: Outfitting

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the construction mechanic in the specialized subject area of outfitting is qualified to perform work assignments in the area of manufacturing repair and reconstruction of elevators, steel, non-ferrous and plastic conveyance machinery and building equipment.

Their tasks involve manufacturing, assembling, recon-structing, repairing and maintaining construction lifts, hoists and elevators for persons, transport and equipment, handling, grills, railings, stairs, doors, gates, windows, platforms, covers and panels.

These tasks are performed individually or in teams, predominantly in independent single-part production and small batch serial production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials		8	4
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	4		
Maintaining working equipment and production plant	5	5	2
Quality control, marking out and marking	2		
Adjusting and clamping tools and workpieces	3		
Manual cutting	2		
Machine cutting	8	2	2
Separating, shaping	4	5	
Joining	4	14	
In-depth treatment of basic vocational training	8	8	
Assembling components into assemblies	12		
Separating with hand-held machines		10	
Joining, especially by shielded arc welding, bolts and screws			2
Setting up, installing and testing pneumatic or hydraulic systems			12
Assembling and dismantling fixed and movable building and equipment constructions			8
Fastening, securing, transporting and testing building and equipment constructions and starting operations with these			18
Maintaining building and equipment constructions			16
			12
	52	52	78

* To be imparted during the entire training period

CONSTRUCTION MECHANIC

Specialization: **Sheet Metal Construction**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the construction mechanic in the specialized subject area of sheet metal construction is qualified to perform work assignments in the area of parts manufacture in light sheet and medium plate metal. They work with steel, non-ferrous metals and plastic.

Their tasks involve manufacturing and assembling containers, mantles, protective devices, sheet metal pipes, sheet metal channels, ventilation shafts and automobile bodies and body parts. They repair car motor vehicle bodies or sheet metal constructions.

These tasks are performed individually or in teams in production plants or at construction sites predominantly in independent single-part and small batch serial production, while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials		8	8
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	4		2
Maintaining working equipment and production plant	5	5	5
Quality control, marking out and marking	2		
Adjusting and clamping tools and workpieces	3		
Manual cutting	2		
Machine cutting	8	2	4
Separating, shaping	4	5	
Joining	4	14	
In-depth treatment of basic vocational training	8	8	
Assembling components into assemblies	12		
Separating with stationary and hand-held machines		10	
Cutting and forming of sheet metal			6
Joining, especially by welding of sheet metal and by forming			12
Machining and treating surfaces			13
Assembling, dismantling and repairing sheet metal constructions			6
Setting up and operating machines for sheet metal			18
			4
	52	52	78

* To be imparted during the entire training period

PLANT MECHANIC

Specialization: **Equipment Engineering**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the plant mechanic in the specialized subject area of equipment engineering is qualified to perform work assignments in the area of manufacturing and repair of equipment.

Their tasks involve manufacturing, assembly, testing and repairing equipment, especially in the areas of processing, food, energy and supply engineering.

These tasks are performed independently, both individually and in teams in workshops and at construction sites, indoors and outdoors in single-part production while observing the relevant laws, safety regulations, documents and instruct-ions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	6	6
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	2	2 4
Maintaining working equipment and production plant	2		
Quality control, marking out and marking	3		
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	4	
Machine cutting	4	2	
Separating, shaping	4	18	
Joining	8	14	2
In-depth treatment of basic vocational training	12		
Constructing, identifying and producing templates and profiles		6	
Separating, shaping			12
Drawing and marking components and assemblies			4
Assembling components, assemblies and equipment			32
Checking of components and assemblies and instruments			4
Repairing equipment			8
Fastening, securing and transporting			4
	52	52	78

* To be imparted during the entire training period

PLANT MECHANIC

Specialization: **Supply Engineering**

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the plant mechanic in the specialized subject area of supply engineering is qualified to perform work assignments in the area of manufacturing and repair of pipelines and ventilation equipment.

Their tasks involve manufacturing, assembling, testing, starting-up, maintaining, inspecting and repairing pipelines, pipeline systems, pipeline and ventilation equipment, especially in the areas of ventilation, conveyance, power plant, processing, high pressure engineering, transmission lines and air conditioning.

They identify malfunctions, trace their causes, eliminate the malfunctions or instigate their removal. They institute or initiate procedures for preventative maintenance.

These tasks are performed independently, both individually and in teams in workshops and at construction sites, indoors and outdoors at several levels, in single-part production while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	6	6
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	2	2 4
Maintaining working equipment and production plant	2		
Quality control, marking out and marking	3		
Adjusting and clamping tools and workpieces	2		
Manual cutting	8	4	
Machine cutting	4	2	
Separating, shaping	4	18	
Joining	8	14	
In-depth treatment of basic vocational training	12		
Constructing, identifying and producing templates and profiles		6	
Shaping, including shaping plastic by bending			10
Welding plastic materials			2
Drawing and marking components and assemblies			4
Assembling and dismantling components, assemblies and supply equipment systems			30
Checking components, assemblies and supply equipment systems			6
Starting up supply equipment systems			4
Maintaining supply equipment systems			10
	52	52	78

* To be imparted during the entire training period

MOTOR VEHICLE MECHANIC

Duration of vocational training: 3½ years

Description:

Occupation Profile: On the basis of his/her vocational training, the motor vehicle mechanic is qualified to perform work assignments in the area of manufacturing and repair of motor vehicles.

Their tasks involve repairing, inspecting, maintaining and outfitting as well as assembling motor vehicles, including trailers. Their primary tasks are the systematic diagnosis of faults on complex mechanical, pneumatic, hydraulic, electrical and electronic motor vehicle systems, the assembly of components to assemblies and the setting of nominal values as well as the testing and evaluation of the function and condition of motor vehicle parts and systems.

These tasks are performed independently while observing the relevant laws, safety regulations, documents and instructions.

OCCUPATION PROFILE IN BRIEF

with Standard Times from the General Syllabus

Skills and Knowledge in	Standard Times weeks for Year 1	2	3/4
Basic vocational training, corporate structure and organization of training enterprise, labour and wage law, job protection, health and safety at work, environmental protection and rational energy utilization	*	*	*
Reading, applying and writing technical documents, identifying, categorizing and handling work materials and operating materials	4	4	6
Planning and controlling of work flow and sequence of movements, checking and evaluating the results	5	4	6
Maintaining working equipment and production plant	2		
Quality control, marking out and marking	3		
Adjusting and clamping tools and workpieces	2		
Manual cutting	8		
Machine cutting	4		
Separating, shaping	4		
Joining	8	4	
In-depth treatment of basic vocational training	12		
Maintaining motor vehicles		9	8
Dismantling and assembling components, assemblies and systems in motor vehicles		16	22
Repairing components, assemblies and systems in motor vehicles		4	14
Checking for variations in form and position, compression, temperature, supply volumes and voltage		6	3
Testing and adjusting components, assemblies and systems in motor vehicles		5	9
Localizing and identifying faults and malfunctions			10
	52	52	78

* To be imparted during the entire training period

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